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CENTRAL FAX CENTER**PATENT****AUG 28 2006**

Atty Docket No.: 200302011-1

In The U.S. Patent and Trademark Office**In Re the Application of:**

Inventor(s): Jeffrey Clifford Mogul et al. **Confirmation No.:** 8549
Serial No.: 10/033,404 **Examiner:** Brian J. Gillis
Filed: December 27, 2001 **Group Art Unit:** 2141
Title: SYSTEM AND METHOD FOR ENERGY EFFICIENT DATA
PREFETCHING

MAIL STOP APPEAL BRIEF - PATENTS

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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I hereby certify that this correspondence is being transmitted to the Patent and Trademark Office facsimile number (571) 273-8300 on August 28, 2006. This correspondence contains the following document(s):

1 sheet of Transmittal Letter for Appeal Brief (2 copies).
27 sheets of Appeal Brief including Appendices.

Respectfully submitted,

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August 28, 2006

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PATENT APPLICATION

AUG 28 2006

ATTORNEY DOCKET NO. 200302011-1

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Jeffrey Clifford Mogul et al.

Confirmation No.: 8549

Application No.: 10/033,404

Examiner: Brian J. Gillis

Filing Date: Dec. 27, 2001

Group Art Unit: 2141

Title: SYSTEM AND METHOD FOR ENERGY EFFICIENT DATA PREFETCHING

Mail Stop Appeal Brief-Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Sir:

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on June 26, 2006.

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) \$500.00.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

() (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d) for the total number of months checked below:

| | |
|------------------|-----------|
| () one month | \$120.00 |
| () two months | \$450.00 |
| () three months | \$1020.00 |
| () four months | \$1590.00 |

() The extension fee has already been filled in this application.

(X) (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account 08-2025 the sum of \$500.00. At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees. A duplicate copy of this sheet is enclosed.

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Jeffrey Clifford Mogul et al.

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CENTRAL FAX CENTER

AUG 28 2006

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Attorney Docket No.: 200302011-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**Inventor(s):** Jeffrey Clifford Mogul et al. **Confirmation No.:** 8549**Serial No.:** 10/033,404 **Examiner:** Brian J. Gillis**Filed:** December 27, 2001 **Group Art Unit:** 2141**Title:** SYSTEM AND METHOD FOR ENERGY EFFICIENT DATA
PREFETCHING**MAIL STOP APPEAL BRIEF - PATENTS**

Commissioner for Patents

P.O. Box 1450

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APPEAL BRIEF - PATENTS

Sir:

This is an Appeal Brief in response to, the decisions of the Examiner in a Final Office Action dated April 26, 2006 and in connection with the Notice of Appeal filed June 26, 2006. Each of the topics required in an Appeal Brief and a Table of Contents are presented herewith and labeled appropriately.

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(1) Real Party In Interest

The real party in interest is the Hewlett-Packard Development Company, L.P.

(2) Related Appeals and Interferences

There are no other appeals or interferences related to this case.

(3) Status of Claims

Claims 1-39 are pending and rejected. All pending claims are hereby appealed.

(4) Status of Amendments

No amendments were filed subsequent to the Final Rejection in the Office Action mailed on April 26, 2006.

(5) Summary of Claimed Subject Matter

According to various embodiments, systems and methods are described that allow for energy efficient data prefetching. The process of prefetching is described at least on page 2, lines 6-14 of the Specification, as a technique whereby a client computer system predicts a future request for a file from a remote server. If the prediction results in a high likelihood that the user of the client computer system will desire the file, the client computer system may retrieve the file from the remote server before it is actually requested by the user. As claims 1-10 and 37 recite, the claimed systems and methods may be embodied in a computer readable medium or a computer program product, which is also described on page 13, lines

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16-25 of the specification. That passage states that the claimed computer product is embedded in a computer readable storage medium, which may contain program modules.

Independent claims 1, 11, 21, and 37-39 state that the system and method utilize a prefetch prediction model, which includes the use of energy usage parameters for predicting an impact on energy usage during the prefetching of files. Independent claim 32 states that a prefetch predictor may be used for the same purpose as the prefetch prediction model. The prefetch prediction model ("118" of Figure 3) is described in page 6, line 25-page 9, line 16 of the Specification. More specifically, page 6, lines 26-32 and page 7, lines 1-25 state that the prefetch prediction model 118 may include the following parameters: energy usage parameters, user usage pattern parameters, CPU energy usage parameters 160, network interface energy usage parameters 162, memory access energy usage parameters 163, energy supply parameters 164, user behavior and preference parameters 166, network characteristics parameters 168, client cache status 170, and prefetch benefit determination parameters 172. Page 7 of the Specification describes several energy parameters as including read/write energy costs per byte or word, power load, and battery life. Independent claims 37-38 recite that cost parameters may also be used for predicting an impact on monetary charges incurred by the client computer system. The costs parameters are defined on page 9, lines 8-12 of the Specification as including energy usage parameters.

The claimed system and method may include a prefetch prediction engine 122, which uses the information from the prefetch prediction model 118 and other information to predict the net impact on energy usage by the client computer that would result from prefetching specified files, as described in page 8, lines 8-10 of the Specification. The prefetch prediction

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engine 122 may determine which files to add to the prefetch queue by using data listed on page 8, lines 13-22.

(6) Grounds of Rejection to be Reviewed on Appeal

A. Whether claims 1-10 and 37 are directed towards non-statutory subject matter under 35 U.S.C. §101.

B. Whether claims 1-31 and 37-39 are unpatentable under 35 U.S.C. §103(a) over Shatil et al. (6,728,840) ("Shatil") in view of Saxena (US2002/0103778).

C. Whether claims 32-34 are unpatentable under 35 U.S.C. §103(a) over Malkin et al. (6,085,193) ("Malkin") in view of Shatil.

D. Whether claims 35 and 36 are unpatentable under 35 U.S.C. §103(a) over Malkin in view of Shinozaki (6,173,392).

(7) Arguments**A. The rejection of claims 1-10 and 37 under 35 U.S.C. §101 is improper**

Independent claims 1 and 37 are drawn to "a computer program product for use in conjunction with a client computer system...the computer program product comprising a computer readable storage medium and a computer program mechanism embedded therein."

The MPEP states that "the claimed invention as a whole must accomplish a practical application. That is, the claimed invention must produce a "useful, concrete and tangible result." *State Street*, 149 F.3d at 1373, 47 USPQ2d at 1601-02. See MPEP 2106. Here, claims 1-10 and 37 comply with 35 U.S.C. §101 because claims 1-10 and 37 produce a useful, concrete, and tangible result, which is the creation of a computer program product

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comprising a computer readable storage medium, where the computer program provides instructions for storing prefetch prediction entries in a queue and instructions for fetching files identified by the entries in the queue.

The rejection of claims 1-10 and 37 states that the "specification refers to a computer program product not tangibly embodied by the transmission of a computer data signal on a carrier wave. The computer program product must be in a tangible embodiment such as a storage medium and not a transmission medium (Final Rejection, mailed 4/26/06)."

It is respectfully submitted the Examiner failed to fully consider the language of independent claims 1 and 37, because claims 1 and 37 specifically recite that the computer program product is embodied in "a computer readable storage medium." The originally filed specification further reiterates and supports the claim language as it states "a computer program product that includes a computer program mechanism **embedded in a computer readable storage medium** (page 13, lines 16-18)." The originally filed specification further states that computer readable storage mediums may include CD-ROM, magnetic disk storage products, or any other computer readable data or program storage product (page 13, lines 20-22)." The only reference to a carrier wave within the originally filed specification occurs with respect to the description of software modules, which may also be included in the computer program product. The specification states that software modules may be distributed by computer data signals on a carrier wave (page 13, lines 22-25).

Therefore, the claims themselves recite that the computer program product is stored on a storage medium and the originally filed specification further supports the claims. The MPEP states that "when functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium **and will**

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be statutory in most cases since use of technology permits the function of the descriptive material to be realized. Compare *In re Lowry*, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) (claim to data structure stored on a computer readable medium that increases computer efficiency held statutory) and *Warmerdam*, 33 F.3d at 1360-61, 31 USPQ2d at 1759 (claim to computer having a specific data structure stored in memory held statutory product-by-process claim) In the final analysis under 101, the claimed invention, as a whole, must be evaluated for what it is." (quoted with approval in *Abele*, 684 F.2d at 907, 214 USPQ at 687). See also *In re Johnson*, 589 F.2d 1070, 1077, 200 USPQ 199, 206 (CCPA 1978) ("form of the claim is often an exercise in drafting")." See MPEP 2106.

Here, as set forth above, the computer program product is embodied on a tangible storage medium. Therefore, claims 1-10 and 37 comply with the provisions of 35 U.S.C. §101 and the rejection must be withdrawn.

B. The rejection of claims 1-31 and 37-39 under 35 U.S.C. §103(a) as patentable over Shatil in view of Saxena is improper

The test for determining if a claim is rendered obvious by one or more references for purposes of a rejection under 35 U.S.C. § 103 is set forth in MPEP § 706.02(j):

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

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Therefore, if the above-identified criteria are not met, then the cited reference(s) fails to render obvious the claimed invention and, thus, the claimed invention is distinguishable over the cited reference(s).

1. Claims 1-31

Shatil and Saxena, considered alone or in combination, fail to teach or suggest at least "energy usage parameters for predicting an impact on energy usage," as recited in independent claims 1, 11, and 21. The Final Rejection, mailed 4/26/06, alleges that Shatil discloses "energy efficiency data" in column 11, lines 48-58, column 16, lines 56-67, column 17 lines 1-8 (Response to Arguments Section, page 13, lines 19-22 and page 14, lines 1-3 of the Final Rejection). While Shatil is drawn to a prefetch engine using prefetch criteria, Shatil fails to teach or suggest energy usage parameters. For instance, column 11, lines 48-58 of Shatil define prefetch criteria as the listing of "various requesters (e.g., applications, programs, processes, users, remote computers) that can access data (e.g., specific files, databases, records, volumes) stored within the data storage system." Columns 16 and 17 of Shatil also define prefetch criteria as "requester criteria, "data access technique criteria," and "data criteria." Column 17 of Shatil defines prefetching information as information which "specifies caching instructions" which specify how data is to be cached within the data storage subsystem. Thus, the passages of Shatil, cited by the Examiner, fail to make any mention or suggestion, whatsoever, of energy usage parameters.

In fact, while Shatil discloses the use of prefetch criteria, the entire disclosure of Shatil is completely silent with respect to energy usage parameters. Columns 16 and 17 of Shatil describe Figure 5, which lists the prefetch criteria. Like the specification, Figure 5 is

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completely devoid of any suggestion to utilize energy usage parameters, as claims 1, 11, and 21 recite. Column 18, lines 20-25 of Shatil describe a category for "other prefetch criteria," however, Shatil provides examples of other prefetch criteria 404 in Figure 5. The other prefetch criteria 404 includes the size of the files and a time period which must be satisfied. The other prefetch criteria of Shatil is not remotely related to energy usage parameters. Therefore, Shatil fails to provide any teaching or suggestion of energy usage parameters.

Saxena, like the remaining prior art of record, fails to cure the deficiencies of Shatil, because Saxena also fails to teach or suggest energy usage parameters. The Applicants note that the Examiner has not attempted to allege that Saxena teaches or suggests energy usage parameters. Claims 2-10, 12-20, and 22-31 are allowable at least by virtue of their respective dependencies on independent claims 1, 11, and 21.

2. Claims 37-39

Shatil and Saxena fail to at least teach or suggest "cost parameters for predicting an impact on monetary charges incurred by the client computers system" and "cost efficiency prefetch criteria," as recited in independent claims 37-39. The Final Rejection, mailed 4/26/06, acknowledges that Shatil fails to teach or suggest cost parameters and cost efficiency prefetch criteria (page 10, lines 5-8). The Final Rejection then alleges only that "Saxena teaches of using transaction weight to determine the importance of web pages when cost parameters are required (paragraph 32, lines 2-15)." However, Saxena fails to teach or suggest the claimed "cost parameters for predicting an impact on monetary charges" and "cost efficiency prefetch criteria."

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The Examiner correctly points out that Saxena only discloses using "transaction weight" to determine the "importance of web pages." As Saxena discloses, only the importance of certain web pages to other requested web pages is used in the determination of transaction weight to decide whether or not to cache the certain web pages. Therefore, cost is not a factor used in Saxena to make a prefetch determination, but only the "importance of web pages," which is not based on cost or monetary charges.

In contrast, claims 37-39 recite the use of "cost parameters for predicting an impact on monetary charges incurred by the client computer system." Claims 37-39 therefore actively use cost parameters for predicting possible monetary charges associated with prefetching. Saxena, on the other hand, only uses "importance" (i.e. relevance or similarity) as a basis for making prefetch decisions. That is, the only input used in the prefetching determination of Saxena is "importance." Any cost savings associated with the disclosure of Saxena is merely a by-product of certain web pages lacking the necessary "importance," and therefore, not cached in a prefetching operation. In direct contrast to Saxena, claims 37-39 recite "a prefetch prediction model including cost parameters for predicting an impact on monetary charges." Claims 37-39, therefore, use cost as an input to make a prefetch decision. Prefetching costs, as recited in claims 37-39, are determined before a prefetch decision is made, because prefetching costs are used to make a prefetching decision, as opposed to Saxena, which simply determines importance and then makes a prefetch determination. Thus, Saxena fails to cure the deficiencies of Shatil by failing to teach or suggest the use of "cost parameters for predicting an impact on monetary charges incurred by the client computer system." Similarly, the remaining prior art of record fails to cure the deficiencies of Shatil and Saxena.

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In addition, Saxena fails to teach or suggest "predicting an impact on monetary charges incurred by the client computer system," as recited in independent claims 37-38. Saxena specifically discloses that the "origin server is paying for caching services." Therefore, Saxena only discloses using importance as a factor in relation to the origin server and not a client machine.

Because Shatil and Saxena fail to teach or suggest all the features of independent claims 1, 11, 21, and 37-39, it is respectfully submitted that the Examiner failed to establish a *prima facie* case of obviousness against claims 1-31 and 37-39. Consequently, it is respectfully submitted that these claims are allowable over the references of record and that the rejection should be reversed.

C. The rejection of claims 32-34 under 35 U.S.C. §103(a) as being unpatentable over Malkin in view of Shatil is improper

With respect to independent claim 32, Malkin and Shatil, considered alone or in combination fail to teach or suggest at least identifying "energy efficient criteria." The Final Rejection, mailed 4/26/06, acknowledges that Malkin fails to teach or suggest using energy efficient criteria (page 11, lines 13-14). Here, as opposed to the rejection of claims 1-31 and 37-39, discussed above, the Examiner correctly acknowledges that Shatil only discloses "using various types of criteria to allow access to files." The Examiner does not even allege that Shatil teaches the use of energy efficient criteria. The Examiner also fails to allege that it would have been obvious to use energy efficient criteria. Therefore, the Examiner has ignored the claimed features by not even attempting to reject this element claim 32.

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Accordingly, the Examiner failed to establish a *prima facie* case of obviousness against claims 32-34 and the rejection of these claims should be withdrawn. Consequently, it is respectfully submitted that these claims are allowable over the references of record, because the prior art of record at least fails to teach or suggest energy efficient criteria.

D. The rejection of claims 35 and 36 under 35 U.S.C. §103(a) as being unpatentable over Malkin in view of Shinozaki is improper

Initially, the rejection of claims 35 and 36 is not fully understood by the Applicants. Claims 35 and 36 depend from independent claim 32, which is rejected over Malkin in view of Shatil, because Shatil was erroneously relied upon, in part, as allegedly providing a teaching of energy efficient criteria. However, the Examiner did not rely on Shatil in rejecting claims 35 and 36. For at least this reason, the rejection of claims 35 and 36 should be reversed.

In any event, Malkin and Shinozaki, considered alone or in combination, fail to teach or suggest energy efficient criteria. The Examiner admits that Malkin fails to teach this feature, as set forth above, and does not even attempt to allege that this feature is taught or suggested by Shinozaki.

In addition, claim 36 recites "predicting an impact on energy usage by the client computer." The Examiner acknowledges that this feature exists in claim 36, however, then fails to address it (Final Office Action, page 13, lines 8-12). The Examiner only alleges that Malkin "further teaches of a prefetching unit, which takes into consideration the impact of storing the object." The Examiner's failure to address the features of the claims may be due

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to the deficiencies of Malkin, because Malkin fails to teach or suggest that energy efficient criteria is considered.

Accordingly, the Examiner failed to establish a *prima facie* case of obviousness against claims 35 and 36 and the rejection over these claims should be withdrawn. Consequently, it is respectfully submitted that these claims are allowable over the references of record.

(8) Conclusion

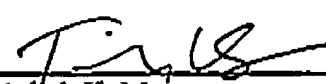
For at least the reasons given above, the rejections of claims 1-39 are improper. Accordingly, it is respectfully requested that such rejections by the Examiner be reversed and these claims be allowed. Attached below for the Board's convenience is an Appendix of claims 1-39 as currently pending.

Please grant any required extensions of time and charge any fees due in connection with this Appeal Brief to deposit account no. 08-2025.

Respectfully submitted,

Dated: August 28, 2006

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(9) Claim Appendix

1. A computer program product for use in conjunction with a client computer system having at least one application having instructions for specifying files to be fetched from a server, the computer program product comprising a computer readable storage medium and a computer program mechanism embedded therein, the computer program mechanism comprising:

a prefetch prediction model including energy usage parameters for predicting an impact on energy usage by the client computer system that would result from prefetching specified files;

a prefetch prediction engine coupled to the prefetch prediction model for evaluating the specified files with respect to prefetch criteria, including energy efficiency prefetch criteria, and generating a prefetch decision with respect to each file of the specified files;

instructions for storing in a queue entries identifying each specified file for which the prefetch prediction engine generates an affirmative prefetch decision; and instructions for fetching files identified by entries in the queue.

2. The computer program product of claim 1, including a model updater, coupled to the prefetch prediction model, for updating the energy usage parameters of the prefetch prediction model in accordance with results of past prefetch decisions.

3. The computer program product of claim 1, including instructions for detecting a current energy supply level of the client computer system, wherein the prefetch criteria

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include criteria that are a function of the current energy supply level of the client computer system.

4. The computer program product of claim 1, including instructions for detecting fullness of a cache in the client computer system, wherein the prefetch criteria include criteria that are a function of the cache fullness,

5. The computer program product of claim 1, wherein at least one of the specified files is identified in a message received from the server.

6. The computer program product of claim 1, wherein at least one of the specified files is identified by the at least one application in the client computer system.

7. The computer program product of claim 1, wherein the queue comprises a prefetch queue;

the computer program mechanism further comprising:

instructions for storing in a fetch queue entries identifying the files specified by the at least one application program to be fetched; and

a scheduler for scheduling downloading of files identified by entries in the fetch queue and files identified by entries in the prefetch queue, the scheduler giving priority to the files identified by the entries in the fetch queue.

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8. The computer program product of claim 7, wherein the scheduler includes instructions for determining whether to download a file identified by an entry in the prefetch queue in accordance with predefined scheduling criteria, the predefined scheduling criteria including at least one criteria selected from the set consisting of client cache status, user behavior and preferences, network congestion, bandwidth availability between the client computer system and the server, round-trip time from client to server, and a current energy supply level of the client computer system.

9. The computer program product of claim 1, including queue pruning instructions for re-evaluating entries in the queue and flushing from the queue any entries in the queue deselected by the re-evaluating.

10. The computer program product of claim 1, including a model updater, coupled to the prefetch prediction model, for updating the energy usage parameters of the prefetch prediction model in accordance with energy usage statistics.

11. A method for performing energy efficient data prefetching in conjunction with a client computer system, comprising:

predicting, in accordance with a prefetch prediction model having energy usage parameters, an impact on energy usage by the client computer system that would result from prefetching specified files;

evaluating the specified files with respect to prefetch criteria, including energy efficiency prefetch criteria;

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generating a prefetch decision with respect to each file of the specified files; storing in a queue entries identifying each specified file for which an affirmative prefetch decision was generated; and

fetching files identified by entries in the queue.

12. The method of claim 11, updating the energy usage parameters of the prefetch prediction model in accordance with results of past prefetch decisions.

13. The method of claim 11, wherein the prefetch criteria include criteria that are a function of a current energy supply level of the client computer system.

14. The method of claim 11, wherein the prefetch criteria include criteria that are a function of cache fullness of the client computer system.

15. The method of claim 11, including receiving a message from a server that includes information identifying at least one of the specified files.

16. The method of claim 11, including executing at least one application that specifies files to be fetched from a server, the executing of the at least one application including identifying at least one of the specified files.

17. The method of claim 16, wherein the queue comprises a prefetch queue; the method further comprising:

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storing in a fetch queue entries identifying the files specified by the at least one application program to be fetched; and

scheduling downloading of files identified by entries in the fetch queue and files identified by entries in the prefetch queue, giving priority to the files identified by the entries in the fetch queue.

18. The method of claim 17, further comprising:

determining whether to download a file identified by an entry in the prefetch queue in accordance with predefined scheduling criteria, the predefined scheduling criteria including at least one criteria selected from the set consisting of client cache status, user behavior and preferences, network congestion, bandwidth availability between the client computer system and the server, round-trip time from client to server, and a current energy supply level of the client computer system.

19. The method of claim 11, further comprising:

re-evaluating entries in the queue and flushing from the queue any entries in the queue deselected by the re-evaluating.

20. The method of claim 11, updating the energy usage parameters of the prefetch prediction model in accordance with energy usage statistics.

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21. A computer system comprising:

at least one processing unit for executing procedures containing executable instructions;

a prefetch prediction model including energy usage parameters for predicting an impact on energy usage by the computer system that would result from prefetching specified files;

a prefetch prediction engine, executable by the at least one processing unit and coupled to the prefetch prediction model, for evaluating the specified files with respect to prefetch criteria, including energy efficiency prefetch criteria, and generating a prefetch decision with respect to each file of the specified files;

memory, including a queue for storing entries identifying each specified file for which the prefetch prediction engine generates an affirmative prefetch decision; and

a download module, executable by the at least one processing unit, having instructions for fetching files identified by entries in the queue.

22. The computer system of claim 21, including a model updater, executable by the at least one processing unit, coupled to the prefetch prediction model, for updating the energy usage parameters of the prefetch prediction model in accordance with results of past prefetch decisions.

23. The computer system of claim 21, including an energy supply detection module, executable by the at least one processing unit, having instructions for detecting a current

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energy supply level of the computer system, wherein the prefetch criteria include criteria that are a function of the current energy supply level of the computer system.

24. The computer system of claim 21, wherein the memory further includes a cache, the computer system further comprising a cache fullness detection module, executable by the at least one processing unit, having instructions for detecting fullness of the cache, wherein the prefetch criteria include criteria that are a function of the cache fullness.

25. The computer system of claim 21, wherein at least one of the specified files is identified in a message received from a server.

26. The computer system of claim 21, further comprising at least one application, executable by the at least one processing unit, wherein at least one of the specified files is identified by the at least one application.

27. The computer system of claim 21, wherein the queue comprises a prefetch queue; the computer system further comprising:

at least one application, executable by the at least one processing unit, having instructions for specifying files to be fetched from a server;

a fetch queue queuing module, executable by the at least one processing unit, having instructions for storing in a fetch queue entries identifying the files specified by the at least one application; and

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a scheduler for scheduling downloading of files identified by entries in the fetch queue and files identified by entries in the prefetch queue, the scheduler giving priority to the files identified by the entries in the fetch queue.

28. The computer system of claim 27, wherein the scheduler includes instructions for determining whether to download a file identified by an entry in the prefetch queue in accordance with predefined scheduling criteria, the predefined scheduling criteria including at least one criteria selected from the set consisting of cache status, user behavior and preferences, network congestion, bandwidth availability between the computer system and the server, round-trip time between the computer system and the server, and a current energy supply level of the computer system.

29. The computer system of claim 21, including a queue pruner, executable by the at least one processing unit, including queue pruning instructions for queue pruning instructions for re-evaluating entries in the queue and flushing from the queue any entries in the queue deselected by the re-evaluating.

30. The computer system of claim 21, including a queue pruner, executable by the at least one processing unit, including queue pruning instructions for prioritizing the entries in the queue and for removing from the queue a first entry identifying a previously specified file for which the prefetch prediction engine generated an affirmative prefetch decision, where said first entry is assigned a lower priority than a second entry in the queue.

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31. The computer system of claim 21, including a model updater, executable by the at least one processing unit, coupled to the prefetch prediction model, having instructions for updating the energy usage parameters of the prefetch prediction model in accordance with energy usage statistics.

32. A computer system comprising:

at least one processing unit for executing procedures containing executable instructions;

a server module, executable by the at least one processing unit, for responding to a request from a client computer for a specified file and for generating a reply to the request, the reply including a content portion comprising the specified file; and

a prefetch predictor, executable by the at least one processing unit, for identifying additional files for possible prefetching by the client computer, wherein criteria for identifying includes energy efficiency criteria the server module including instructions for including in a supplemental portion of the reply to the request from the client computer prefetch hint information identifying at least one of the additional files, wherein the supplemental portion is distinct from the content portion of the reply.

33. The computer system of claim 32, wherein the prefetch hint information includes predicted prefetch probability information for at least one of the identified additional files.

34. The computer system of claim 32, wherein the prefetch hint information includes meta information for at least one of the identified additional files, the meta information

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selected from the group consisting of file size information, file type information and information indicating a specific relationship to the specified file in the content portion of the reply.

35. The computer system of claim 32, wherein the prefetch hint information includes an initial additional set of files, the computer system further comprising a pruner, executable by the at least one processing unit, including instructions for selectively removing at least one file of the initial additional set of files.

36. The computer system of claim 35, further comprising a prefetch efficiency model, including prefetch efficiency parameters for predicting an impact on energy usage by the client computer that would result from prefetching specified files, coupled to the pruner, the pruner utilizing the prefetch efficiency model to selectively remove the at least one file of the initial additional set of files.

37. A computer program product for use in conjunction with a client computer system having at least one application having instructions for specifying files to be fetched from a server, the computer program product comprising a computer readable storage medium and a computer program mechanism embedded therein, the computer program mechanism comprising:

a prefetch prediction model including cost parameters for predicting an impact on monetary charges incurred by the client computer system that would result from prefetching specified files;

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a prefetch prediction engine coupled to the prefetch prediction model for evaluating the specified files with respect to prefetch criteria, including cost efficiency prefetch criteria, and generating a prefetch decision with respect to each file of the specified files; instructions for storing in a queue entries identifying each specified file for which the prefetch prediction engine generates an affirmative prefetch decision; and instructions for fetching files identified by entries in the queue.

38. A method for performing energy efficient data prefetching in conjunction with a client computer system, comprising:

predicting, in accordance with a prefetch prediction model having cost parameters, an impact on monetary charges incurred by the client computer system that would result from prefetching specified files;

evaluating the specified files with respect to prefetch criteria, including cost efficiency prefetch criteria;

generating a prefetch decision with respect to each file of the specified files;

storing in a queue entries identifying each specified file for which an affirmative prefetch decision was generated; and

fetching files identified by entries in the queue.

39. A computer system comprising:

at least one processing unit for executing procedures containing executable instructions;

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a prefetch prediction model including cost parameters for predicting an impact on monetary charges incurred by the computer system that would result from prefetching specified files;

a prefetch prediction engine, executable by the at least one processing unit and coupled to the prefetch prediction model, for evaluating the specified files with respect to prefetch criteria, including cost efficiency prefetch criteria, and generating a prefetch decision with respect to each file of the specified files;

memory, including a queue for storing entries identifying each specified file for which the prefetch prediction engine generates an affirmative prefetch decision; and

a download module, executable by the at least one processing unit, having instructions for fetching files identified by entries in the queue.

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(10) Evidence Appendix

None.

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(11) Related Proceedings Appendix

None.